

High-pressure kinetic studies on the formation and phase transitions of methane hydrates in using dynamic-diamond anvil cell (d-DAC)

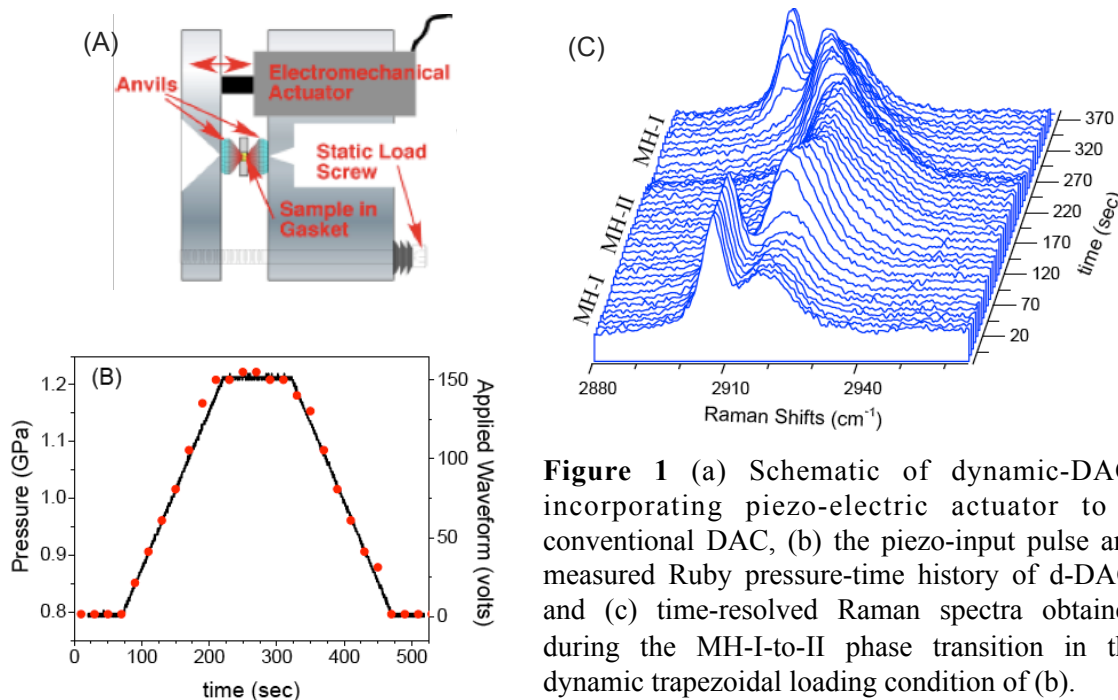


Figure 1 (a) Schematic of dynamic-DAC, incorporating piezo-electric actuator to a conventional DAC, (b) the piezo-input pulse and measured Ruby pressure-time history of d-DAC, and (c) time-resolved Raman spectra obtained during the MH-I-to-II phase transition in the dynamic trapezoidal loading condition of (b).

Fig. 1 Yoo (ACS-PRF # 49207-ND10)



Solid-solid phase transitions of methane hydrates in dynamic loading conditions

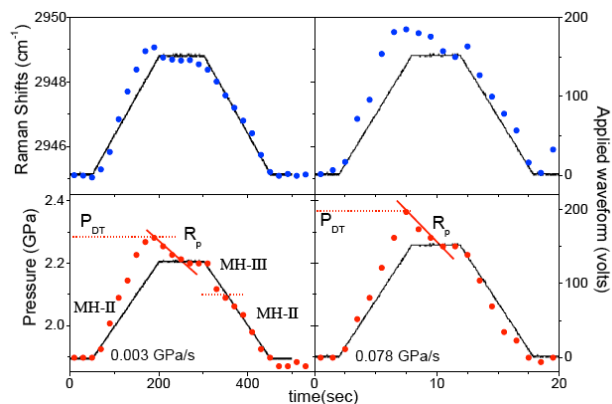
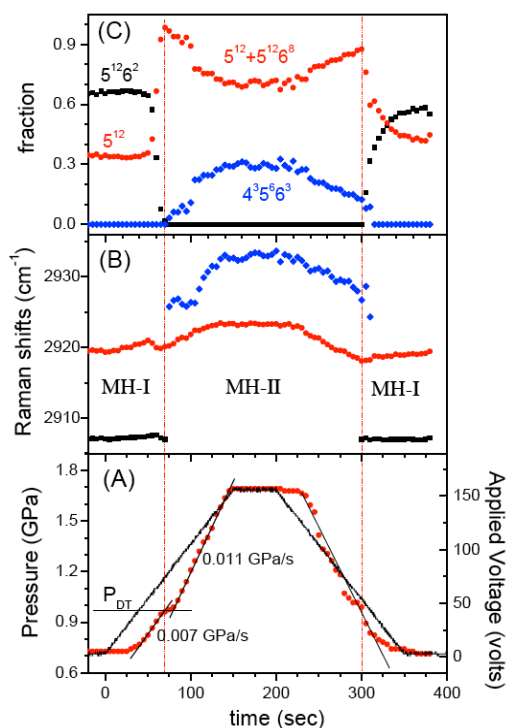


Figure 2. Plotted as a function of time, (Left) during the MH-I-to-II transition (A) the dynamic pressure (red circles) and the applied trapezoidal waveform (black line), (B) the shifts of characteristic Raman peaks for MH-I and MH-II, and (C) the occupancy fractions of different water cages, for comparison, as well as (Right) during the MH-II-to-III transition, the dynamic pressures and spectral Raman shifts of the sample at two different compression rates of 0.009 GPa/s and 0.078 GPa/s.

Fig. 2 Yoo (ACS-PRF # 49207-ND10)



Amorphization of water formed from metastable ice VII in the “no-man’s land” under dynamic loading conditions

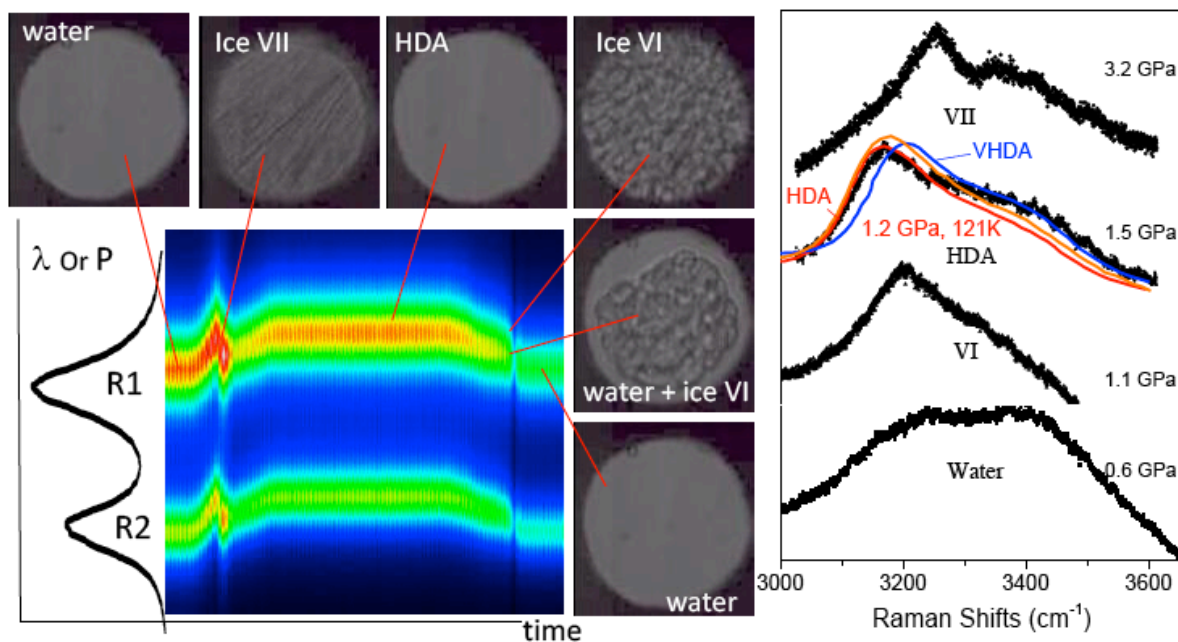


Figure 3. (Left) The time-resolved ruby luminescence for pressure and the selected real-time micro-photographic images distinctive to different phases of water and ice. (Right) The Raman spectra of liquid water, ice VI, HDA, and ice VII, obtained at the peak pressures of different experiments. The Raman spectra of the present HDA (black) formed at 300 K is quite similar to those produced at low temperatures (in blue, orange and red curves).

Fig. 3 Yoo (ACS-PRF # 49207-ND10)

